

## THOROTRAST INDUCED MULTIPLE CARCINOMATOSIS OF THE FRONTAL SINUS

JEFFREY M. ADELGLASS, M.D., MILHEM SAMARA, M.D.,  
JEROME O. CANTOR, M.D., ROBIN M. RANKOW, D.D.S., M.D.,  
ANDREW BLITZER, D.D.S., M.D., AND MARTIN G. LUKEN, M.D.

Departments of Otolaryngology, Pathology, and Neurosurgery  
Columbia University College of Physicians and Surgeons  
New York, New York

**M**ALIGNANT neoplasms of the paranasal sinuses are rare and account for only 0.2% of all human cancers. Of 772 cancers of the paranasal sinuses reported by Lewis,<sup>1</sup> only six (0.6%) were of the frontal sinuses. A review of the literature<sup>1-5</sup> revealed 189 reported cases of frontal sinus carcinoma. We present what we believe to be the first case of thorotrast-induced frontal sinus carcinoma.

### CASE PRESENTATION

A 78-year-old black man (Figure 1) presented with a two-month history of a slowly growing, painless mass over the right frontal sinus. He denied any history of decreased vision, headache, epistaxis, trauma, nasal discharge, or obstruction. Thirty years earlier he had a sinus irrigation with an unknown substance for sinusitis.

On physical examination he had a subcutaneous 4 x 4 cm., firm, fixed, and slightly tender mass in the area of the right frontal bone. There was slight proptosis of the right eye, but visual acuity and extra-ocular movements were intact. Nasal examination revealed bilateral nasal polyps. The remainder of his physical examination, including neurologic examination, was within normal limits. On admission he had a hypochromic, normocytic anemia thought to be secondary to a bleeding polyp of the colon. Sinus roentgenograms demonstrated a lytic lesion in the right frontal area (Figure 2). Tomography revealed a lesion in the right frontal sinus with destruction of the anterior and posterior walls.

Although carcinoma was suspected, a diagnosis of mucocoele or pyocoele

\*Presented at a meeting of the Section on Otolaryngology of the New York Academy of Medicine held May 16, 1979

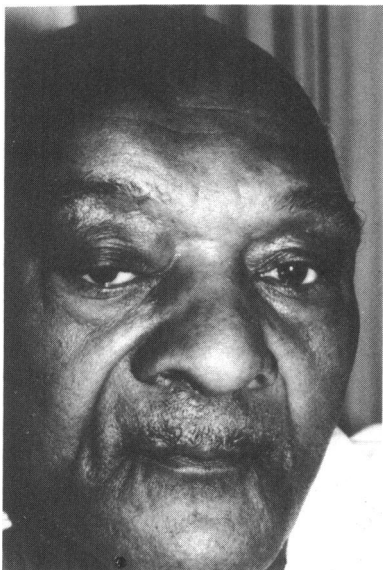


Fig. 1.

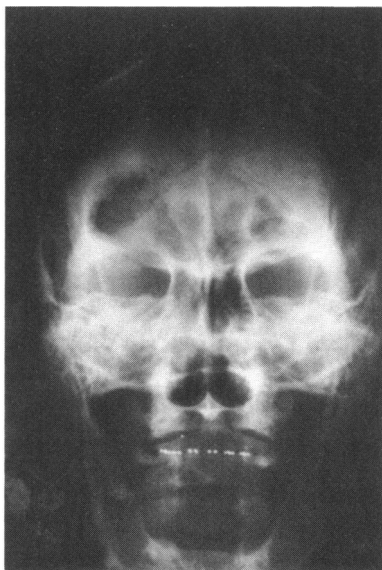


Fig. 2.

was made. The patient underwent a frontal sinus exploration, where a large tumor mass was found. Frozen section revealed squamous cell carcinoma. A portion of the tumor mass was removed for permanent section, and was demonstrated to be radioactive by radioautography.

A computerized axial tomogram demonstrated a mass breaking through the anterior, posterior, and inferior walls of the frontal sinus, and that the tumor mass reached to the dura of the frontal lobe. One week later he underwent a combined craniofacial resection of the right frontal sinus, subtotal resection of the left frontal sinus, the underlying dura, the right orbit, ethmoid, and anterior base of the skull. He then had a fascia lata repair of the dura, and reconstruction with a frontoparietal scalping flap. His postoperative course was complicated by bacterial meningitis, which responded to antibiotic therapy. He was discharged four weeks later.

The tumor mass diffusely infiltrated the soft tissues surrounding the frontal sinus and extended into the dura. Sections of the tumor revealed a predominantly moderately differentiated squamous cell carcinoma. Tumor cells grew in nests and cords and in some areas produced keratin (Figure 3). In the region of the medial margin of surgical resection, a focus of adenoid-cystic carcinoma was seen, representing a second malignancy.

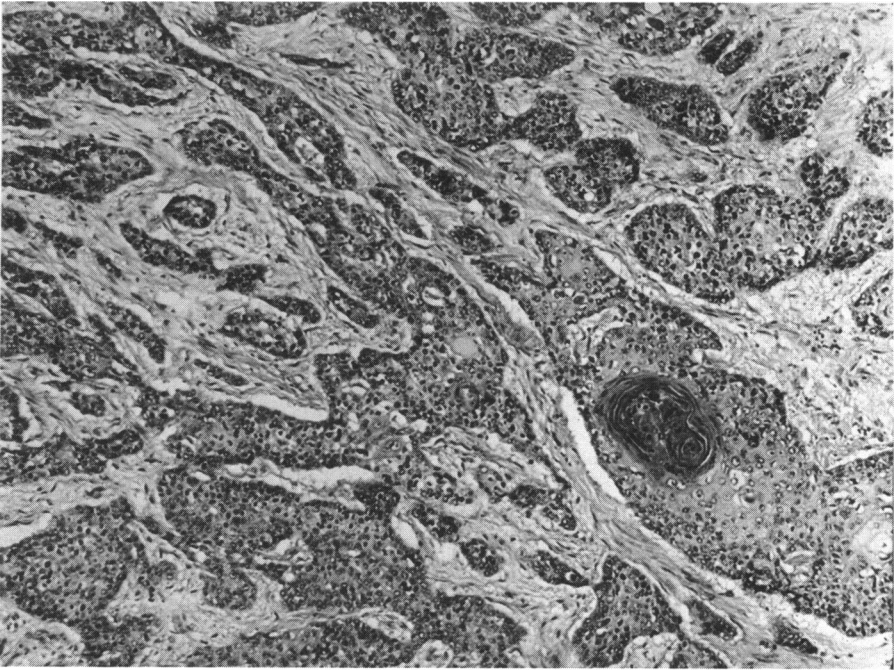


Fig. 3. Squamous cell carcinoma invading the soft tissues in the region of the frontal sinus. An area of keratin pearl formation is present. (x 94) Hematoxylin, phloxin, and safran stain.

This second neoplasm invaded adjacent bone and was distinguished from its companion carcinoma by its markedly different histology and by the presence of PAS-positive material within the lumina formed by the tumor cells (Figure 4). The two carcinomas, although abutting upon one another, did not appear to intermingle (Figure 5).

#### DISCUSSION:

In 1930 thorotrast was developed in Germany.<sup>6</sup> This is a radioactive substance (thorium dioxide) which emits 90% alpha, 9% beta, and 1% gamma particles. Its carcinogenic potential was suspected early, and the Council on Pharmacy and Chemistry of the American Medical Association warned against its use in 1932 and again in 1937.<sup>6</sup> However, it was an excellent contrast medium and was used extensively between 1930 and 1945. Thorotrast was used for irrigation and visualization of the paranasal sinuses.<sup>7</sup> Thirteen cases of thorotrast-induced carcinoma of the maxillary

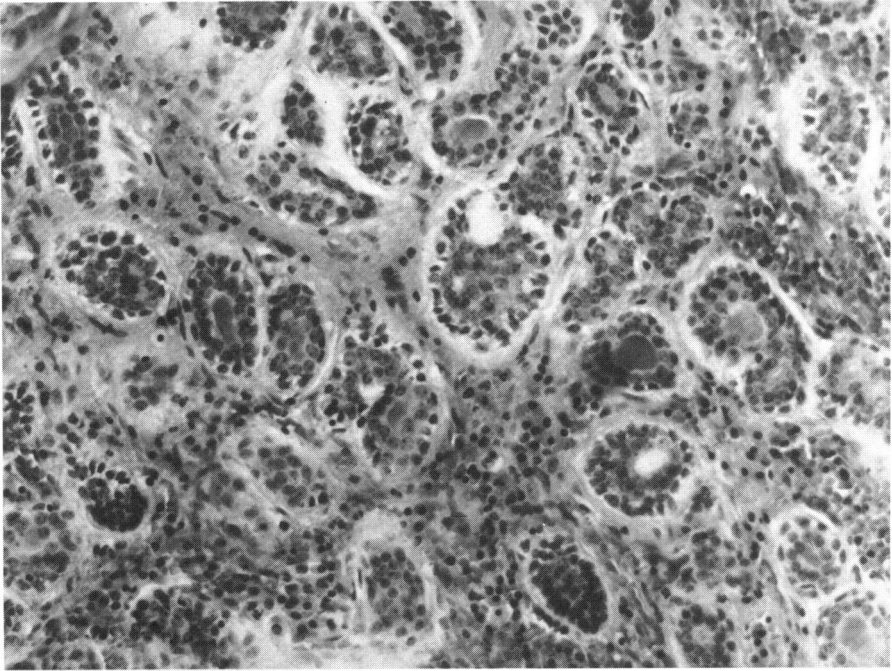


Fig. 4. Adenoid-cystic carcinoma with tumor cells arranged in circular arrays. The material within the lumens formed by the carcinoma is PAS-positive. (x 240) Hematoxylin, phloxin, and safran stain.

sinus<sup>8,9</sup> have been reported, but we believe that our case is the first reported thorotrast-induced frontal sinus carcinoma. Thorotrast has also been the cause of hepatomas, leukemias, urinary tract mesotheliomas, and soft tissue sarcomas.<sup>7</sup> Thorotrast-induced carcinomas are not type-specific, and in our case both squamous cell and adenoidcystic carcinomas were found.

The presence of two distinct histologic patterns within a tumor mass in such close proximity is a rare phenomenon. This appears to be the first reported case of multiple carcinomatosis in the same frontal sinus. Cranio-facial resection with postoperative radiotherapy appears to be the treatment of choice unless there is extension into the sphenoid ridge, pterygoid plates, intracranial extension, or metastatic disease.

In summary, we present the first reported case of thorotrast-induced, multiple carcinomatosis of the frontal sinus. This was treated by cranial facial resection with immediate reconstruction using a frontoparietal scalp-flap.

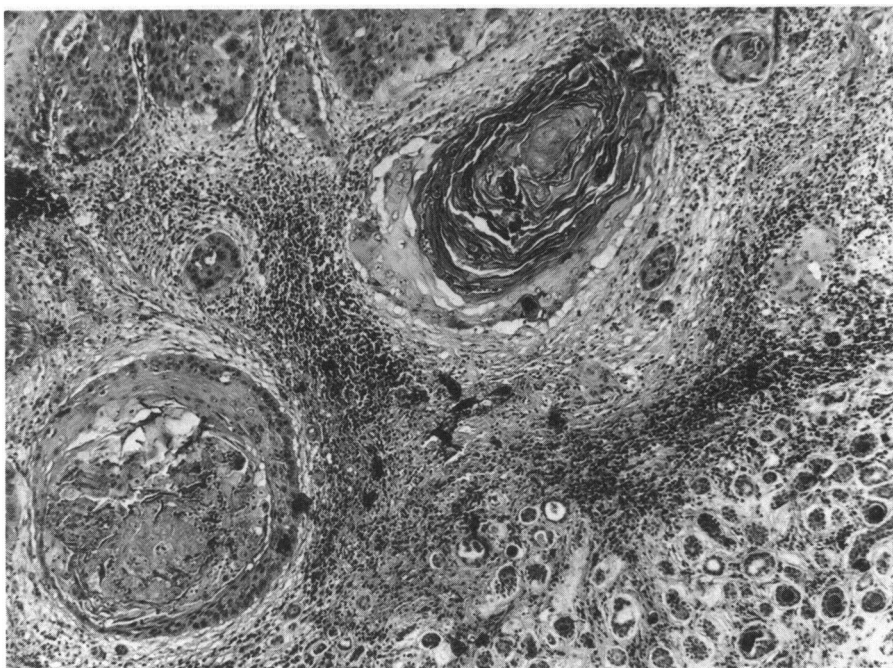


Fig. 5. Juxtaposition of the two carcinomas is clearly shown. Adenoid-cystic carcinoma is seen in the lower right-hand corner. (x 94) Hematoxylin, phloxin, and safran stain.

#### REFERENCES

1. Lewis, J. S. and Castro, E. B.: Cancer of the nasal cavity and paranasal sinuses. *J. Laryngol.* 86:255-62, 1972.
2. Brownson, J. F. and Ogura, J. H.: Primary carcinoma of the frontal sinus. *Laryngoscope* 81:71-89, 1971.
3. Robinson, J. M.: Frontal sinus cancer manifested as a frontal mucocele. *Arch Otolaryngol.* 101:718-21, 1975.
4. Kantawala, S. A.: Primary carcinoma of the frontal sinus: A case report. *J. Postgrad. Med.* 18:99-100, 1972.
5. Takacsi-Nagy, L. and Somls, F.: The role of radiotherapy in the treatment of primary tumors of the frontal sinus. *J. Laryngol. Otol.* 90(2):211-15, 1976.
6. Battifora, H. A.: Thorotrast and Tumors of the Liver. In: *Hepataocellur Carcinoma*, Okuda, K. and Peters, R. L., editors. New York, Wiley, 1976.
7. Winberg, C. D. and Ranchod, M.: Thorotrast-induced hepatic cholangiocarcinoma and angiosarcoma. *Human Path.* 10:108-12, 1979.
8. Kligerman, M., Lattes, R., and Rankow, R.: Carcinoma of the maxillary sinus following thorotrast instillation. *Cancer* 13:967-73, 1960.
9. Rankow, R., Conley, J., and Fodor, P.: Carcinoma of the maxillary sinus following thorotrast instillation. *J. Maxillofac. Surg.* 2:119-26, 1974.